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► **To cite this version:**

Sebastian Grevsmühl. The Environmental History of the Antarctic. Oxford Research Encyclopedia of Environmental Science, 2023, <https://oxfordre.com/environmentalscience>. hal-04155728v1

HAL Id: hal-04155728

<https://hal.science/hal-04155728v1>

Submitted on 7 Jul 2023 (v1), last revised 18 Jan 2024 (v2)

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The Environmental History of the Antarctic

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Summary

Environmental history of the polar regions, and in particular of Antarctica, is a rather recent area of inquiry that is in many ways still in its infancy. As a truly multidisciplinary research field, environmental history draws much inspiration from a large diversity of fields of historical and social research, including economic history, diplomatic history, cultural history, the history of explorations, and science and technology studies. Although overarching book-length studies on the environmental history of Antarctica are still rare, historical scholars have already conducted many in-depth case studies related mostly to three major interrelated research topics: Antarctic governance, natural resource exploitation, and tourism. These recent historical efforts, carried out mostly by a new generation of historians, have thus allowed so far to propose several powerful counternarratives, challenging the frequent yet erroneous assertion that environmental protection and conservation were completely absent from Antarctic affairs before the 1970s. In so doing, environmental historians started offering a much more complex and nuanced account of what is frequently referred to as the “greening” of Antarctica, going well beyond “declensionist” narratives and conservation success stories that commonly pervade not only environmental histories but also public discourse. Indeed, all recent historical studies agree that there is nothing inevitable about the “greening” of Antarctica, nor are conservation and environmental protection its natural destiny. Science, politics, imperialism, capitalism and imaginaries all have played their part in this important history, a history that remains still largely to be written.

Keywords: environmental history, environmental humanities, polar history, conservation, environmental protection, tourism, natural resource extraction, Antarctic governance

Bi-Polar and Antarctic Perspectives

The still relatively young field of environmental history takes inspiration and is at least partly driven by a large variety of fields of historical and social research, such as economic history, diplomatic history and the history of international relations, the history of explorations, and of course science and technology studies and the history of science. In the case of the polar regions, and Antarctica in particular, this rising field of research has attracted increased scholarly attention since the beginning of the 21st century. Several recent publications, such as Alessandro Antonello’s monograph *The Greening of Antarctica* (Antonello, 2019), Adrian Howkins book *The Polar Regions: An Environmental History* (Howkins, 2016), and Joy McCann’s study *Wild Sea: A History of the Southern Ocean* (McCann, 2018) are tangible proof of a vibrant interest in historical research on Antarctica, its environment and surrounding oceans. Most importantly, these recent historical studies show that there is nothing inevitable about the “greening” of Antarctica (see also Antonello, 2014). Moreover,

polar historians argue that the history of Antarctica has much to gain from a comparative bipolar perspective (Howkins & Roberts, 2023).

Indeed, in many ways, treating Antarctic environmental history as a regional or even as a geographically confined subject, can prove problematic, as many important aspects of Antarctic history are closely tied to developments that occur elsewhere in the world (see for instance Roberts, 2011; Zarankin & Senatore, 2005). Its governance is since the signing of the Antarctic Treaty in Washington in 1959 truly international in scope, involving over the course of time a constantly growing diversity of actors (Antonello, 2019). Moreover, at numerous times in history, events that unfolded elsewhere in the world had a direct impact on the environmental history of Antarctica. For instance, as polar historian Adrian Howkins has argued in *The Polar Regions: An Environmental History*, the famous *Exxon Valdez* disaster, an oil spill that occurred in Prince William Sound (Alaska) in 1989, contributed to an important political shift in Antarctic environmental governance, arguably encouraging the now long-standing prohibition of mineral exploitation in Antarctica (Howkins, 2016, p.3). A case can thus be made to consider the Polar Regions together, as a whole, because their histories are often interconnected and they can enrich each other mutually at many occasions.

Nonetheless, one must still keep in mind that there are many crucial differences between the polar regions. Most importantly, contrary to the Arctic, Antarctica has no indigenous, permanent population. Scientists, military and support personnel, and tourism operators all only spend very limited time on the continent, and interactions are thus always of temporary nature. The *polar* category remains therefore fundamentally a *political* one. As Dahl, Roberts and van der Watt have rightly suggested “to be ‘polar’ is to strategically articulate a geopolitical vision” (Dahl, Roberts & van der Watt, 2019). Keeping these critics in mind, writing an environmental history of the Antarctic continent and its surrounding oceans thus necessarily implies choosing a geographical limitation. A commonly accepted definition of Antarctica is the geographical region lying within the Antarctic Convergence. Indeed, the Convergence forms an important ecological and political boundary, well exemplified by the *Convention on the Conservation of Antarctic Marine Living Resources* (CCAMLR). This important zone of transition between warm subtropical waters and cold polar waters, also referred to as the “Polar Front”, is easily observable when aboard a ship as an abrupt change in temperature of air and sea, and it therefore already was noticed by early sealers and whalers heading south for fast profits (McGonigal & Woodworth, 2003, p.50). Sometimes it is useful also to include sub-Antarctic or peri-Antarctic islands that lie North of the Antarctic Convergence, such as Crozet and Amsterdam islands, as they are often part of an administrative whole, as it is for instance the case with the five administrative districts of the French Southern and Antarctic Lands ([*Terres australes et antarctiques françaises*](#), TAAF). Yet in general, most studies considered here either focus on particular activities that took place on the Antarctic continent or within the confines of the Antarctic Convergence.

To survey the diversity of the field of an environmental history of Antarctica, several important topics will be considered in some detail, namely Antarctic governance, the science imperative and environmental regulation, natural resource exploitation, and finally tourism, as these are some of the most important (and obviously inter-connected) topics that stand out in the historical research literature. The considered timeframe is necessarily limited too, as the ‘official’ history of the Antarctic continent only starts in the nineteenth century (for a much longer history of Antarctica, see for example Tammiksaar & Lüdecke, 2023). Indeed, the first recorded sightings of Antarctica did not occur until 1820, and permanent human settlements of the continent did have to await the 1940s when the first permanent stations were set up in

the Antarctic Peninsula region (groups of the Antarctic islands, such as the South Shetlands, were continuously occupied already since the early 20th century).

Antarctic Governance, the Science Imperative and Environmental Regulation

The governance of the Antarctic region and its history is a highly vibrant field of research that produced over the past decades a substantial body of literature that connects to a large variety of research fields. Polar geopolitics for instance, in particular Antarctic geopolitics, have become an important field of study through the pioneering work of scholars such as Klaus Dodds, Sanjay Chaturvedi and Peter Beck (Dodds, 2002 and 1997; Beck, 1986; Chaturvedi, 1996). Legal scholars and diplomats also contributed in many ways to our understanding of the creation and evolution of the Antarctic Treaty System that governs Antarctic affairs today (Watts, 1992). Christopher Joyner has shown in his work that environmental issues were at the core of the general evolution of the Antarctic Treaty System (Joyner, 1987; Joyner, 1998). However, as historian Adrian Howkins has argued, in particular legal perspectives tend to be largely future-oriented, often falling short of thorough historical analysis (Howkins in Dodds, 2017). In other words, there is a longer history to be taken into account of attempts to control and protect the Antarctic environment that largely precedes the environmental treaties that emerged during the last decades of the 20th century. In any case, the common claim that environmental regulation is only a very recent phenomenon in Antarctic affairs (see for example Tin, 2013), most frequently attributed to the rejection of the proposed *Convention on the Regulation of Antarctic Mineral Resource Activities* (CRAMRA), negotiated between 1982 and 1988, does not withstand thorough historical analysis.

Over the past years, historians started offering a more nuanced account of the history of environmental regulation in Antarctica (Howkins in Dodds, 2017; Antonello, 2019; Antonello & Howkins, 2020). In particular sovereignty was identified as a key motive in assertions of what Howkins has labelled “environmental authority” (Howkins, 2011; Howkins, 2017). Indeed, several historians have shown that nation states frequently asserted in the past their authority by regulating Antarctic affairs for “the good of humankind” (see also Roberts, 2011). These assertions span from regulating extractive activities (such as sealing or whaling), to defining what kind of science can be conducted in Antarctica. The concept thus reveals a strong continuity with past strategies used to legitimate sovereignty claims, effectively highlighting the “imperial nature of ongoing links between politics, science, and the environment” (Howkins, 2017, p.210). In fact, and this is not only true for countries with territorial claims in Antarctica, sovereignty and the reserving of future rights remain until today key motivations for engaging in Antarctic science and actively contributing to environmental regulation (see for example Martin-Nielsen, 2021).

Although environmental regulation was largely absent from the Antarctic Treaty signed in 1959 (one major exception was the ban of nuclear explosions and the disposal of radioactive waste material), sovereignty and legal jurisdiction were addressed upfront, and science was successfully established as the dominant currency within the political economy of Antarctic affairs (Herr & Hall in Handmer, 1989). The resulting intensification of scientific activity in the aftermath of the International Geophysical Year (for the history of scientific work conducted in Antarctica, see Fogg, 1992), likely facilitated the introduction of environmental regulations which followed relatively quickly after the signing of the Antarctic Treaty. Legal measures for the *Conservation of Antarctic Fauna and Flora* were added in 1964, followed by the *Convention for the Conservation of Antarctic Seals* in 1972 (cf. Antonello, 2019). Marine living resources received reinforced protection in form of the *Convention for the Conservation of Antarctic Marine Living Resources* (CCAMLR), opened for signature in 1980. CCAMLR was in many ways a major legal and political innovation because Antarctica

was for the first time taken into account as an entire ecosystem, thus largely transgressing traditional geographical boundaries. As a consequence, a geographical approximation of the Antarctic Convergence was introduced as a new legal border (Watts, 1992). The modern era of Antarctic environmental protection often is associated with the collapse of the *Convention on the Regulation of Antarctic Mineral Resource Activities*, brought about (at least in part) by intense protests of leading environmental organizations – most importantly Greenpeace (May, 1988; see also Barnes, 1982) – and the well-known public refusal of France and Australia to sign the text (see Jackson, 2021; Martin-Nielsen, 2023). Yet as Watts and other legal scholars have shown, the mineral negotiations can also be seen as forming part of a much longer Antarctic tradition. In fact, they are remarkably in line with the *Seals* and *Marine Living Resources Conventions*, as the Antarctic Treaty parties always preferred to anticipate problems and address matters in a proactive manner. Issues were in other words anticipated and answers developed well before they became major problems (Watts, 1992).

The Madrid Protocol, the *Protocol on Environmental Protection to the Antarctic Treaty*, was agreed upon in Madrid in 1991. It stays until today a true landmark agreement of Antarctic environmental regulation and governance as it designates Antarctica as a “natural reserve, devoted to peace and science” (Art. 2) and prohibits all activities relating to Antarctic mineral resources, except for scientific research (Art. 7). Although environmental organization would have liked to see the designation of Antarctica as a World Park (implying more stringent environmental regulations), they were mostly pleased with the outcome (Jackson, 2021). Indeed, until 2048, the Madrid Protocol can only be modified if all Consultative Parties agree upon new binding measures, in particular concerning mineral resource exploitation (Art. 25.5). Finally, Art. 11 established the *Committee for Environmental Protection* (CEP) which actively shapes until today, through advice and recommendations, Antarctic environmental regulations. Large environmental organizations (such as Greenpeace and the Antarctic and Southern Ocean Coalition) accompany this process as observers to the Antarctic Treaty Consultative Meetings and they thus can be seen today as forming an active part of the system (Howkins in Dodds, 2017).

Given the overall importance of sovereignty, historians also have shown that the *Protocol on Environmental Protection*, which entered into force in 1998, can be analysed in the context of a much longer political history of imperial ambitions, in particular in relation to which nations have a word to say in Antarctic governance. For instance, historians of science and STS scholars have shown how scientific internationalism was introduced to Antarctic affairs as a crucial diplomatic weapon to counter (at the beginning of the Cold War) a feared Soviet militarization and nuclearization of the region (Turchetti et al., 2008), and with the explicit aim of translating national interests (Elzinga in Crawford, Shinn & Sörlin, 1993; Martin-Nielsen, 2021). With the rise of science as the dominant currency in Antarctic affairs, data sharing practices also received a major role in the political economy of Antarctica (Aronova, 2017; Dean et al., 2008). Moreover, post-colonial and post-imperial perspectives allowed to address the now well-known accusation that Antarctic Treaty member states form an “exclusive club”. They all showed that throughout the Cold War this was an important point of geopolitical friction and the “Question of Antarctica” was raised a number of times by representatives of developing nations from the global South, in particular India and Malaysia (Chaturvedi, 2013; Howkins, 2008; Beck, 1984). As a result, at the United Nations General Assembly, the “Question of Antarctica” was discussed on a regular basis between 1983 and 2005 (Beck in Dodds, Hemmings & Roberts, 2017).

These recent historical studies show that the history of environmental regulation has to be read within a longer political history of Antarctic governance. The rejection of CRAMRA and the signing of the Madrid Protocol thus can be understood as a very efficient response to these

numerous critics (mostly environmental organizations and nations from the global South), allowing to effectively diffuse allegations of the appropriation of resources by a small inner circle of nations. Indeed, with climate change now on top of the list of priorities, the members to the Antarctic Treaty have substantially increased their legitimacy also in the eyes of the international community. As Howkins has argued, with the adoption of the Madrid Protocol, “the ATS (Antarctic Treaty System) has been effective in using environmental regulation to support its political agenda” (Howkins in Dodds, 2017). Sovereignty issues remain of course very important also in this new legal environmental framework and more recent mechanisms, such as the introduction of *Antarctic Specially Protected Areas* (ASPA) and *Antarctic Specially Managed Areas* (ASMA) are in line with older imperialistic ambitions of Antarctic Treaty member states, because they allow those who promote environmental protection measures to act “like de facto sovereigns” (Howkins in Dodds, 2017).

Finally, historical analysis of the negotiations and rejection of a mineral regime for Antarctica suggests that CRAMRA represent only a short episode within a much longer history of natural resource exploitation in Antarctica. As we will see in the following section, sealing and whaling received most of the attention from economic and environmental historians up to now, but together with climate change, other important topics are starting to emerge too, such as iceberg harvesting and the krill fisheries.

A History of Natural Resource Exploitation in the Antarctic

The Sealing Industry as the First Important Antarctic Industry

Natural resource extraction and management (in particular forestry) is a major founding topic in environmental history. In the case of Antarctica, considerable attention has been paid by historians since the 1960s to living resource extraction, in particular the sealing and whaling industries between the eighteenth and twentieth centuries. Economic historians, such as Bjørn Basberg and many other scholars have shown why sealing must be considered the first important exploitative industry in the sub-Antarctic and Antarctic region (Basberg & Headland, 2008; Richards, 2010). These historical studies show that the sealing industry experienced a great boom from the end of the eighteenth century onwards, an economic expansion that lasted for over half a century. Although quantitative estimates, as proposed for instance by Busch, Basberg & Headland or Thierry du Pasquier, must be considered with great caution due to the inherently secretive nature of the industry, false reporting, and the aggregation of catch numbers allowing for no distinction between species, they nonetheless allow to conclude that throughout the nineteenth century sealing saw very important fluctuations in terms of geographical distribution, but also and in terms of absolute numbers of seals slaughtered (Busch, 1985; Basberg & Headland, 2008; Du Pasquier, 1982; see also the whaling databases accessible on <https://whalinghistory.org>). All studies agree on the rapid emergence of a familiar pattern: as sealing grounds were quickly overexploited – in most cases the seal populations were pushed almost to extinction – sealers were regularly in search of new hunting territories which they found ever further south and off the coast (see for example Russ, 2007). The workforce and the number of vessels dedicated to the industry also recorded high fluctuations as many sealers did not stay in business for a long period of time. Most sealing companies were US-American or registered in Great Britain, but also the French and some South African, Australian and New Zealand sealers were searching for fast profits in the South Seas (Headland, 2009, p.63).

Historians generally agree that the narrative of Cook’s second circumnavigation (1772-1775), which reported in 1777 that “seals, or sea bears were pretty numerous” (Cook, 1777, p.213)

on South Georgia, may be considered a founding moment, drawing almost immediately the attention of most American and British sealers to the Antarctic and sub-Antarctic region (Bertrand, 1971, p.28; Simmons, 1993, p.114; see also Burton in Riffenburgh, 2007, p.875). Indeed, at the time, many sealers were already active on the coasts of South America and the off-lying islands, and they were actively seeking new sealing opportunities. South Georgia, the first hunting ground in the South Atlantic lying within the Antarctic Convergence, became thus the first major Antarctic sealing spot (Bonner & Laws, 1964).

For environmental historians, consulting the abundant historical iconography on sealing is worth the effort too, as it reveals often in great detail the gruesome reality of the trade. In particular engravings, paintings and photographs from the nineteenth and early twentieth century show that seals were mostly killed by spear, clubbed or shot (Hart, 2020 & Busch, 1985 are abundantly illustrated). Many photographs also reveal that working conditions were harsh on the isolated islands, with often difficult climatic conditions and cramped living quarters. According to A. G. E. Jones, sealers ranked within the South Sea trade at the very bottom of the hierarchy (Jones, 1981). Many historians have identified as one major problem of the early sealing industry the complete lack of rules and control (see for example Grady, 1986). They argued, for instance, that in the absence of any indigenous Antarctic populations, there were no social customs that could have allowed for regulating the hunting practices in some way or another. Indeed, as all historical case studies on the early Antarctic sealing industry show, massive overexploitation of Antarctic seal stocks was the rule, largely facilitated by the so-called “lay-system” (Basberg & Headland, 2008, p.11) which coupled the salary of the sealers to the number of animals killed. This system did not provide any incentive to preserve a sustainable number of animals for future exploitation, as competitors would also be unlikely to do so, echoing of course Arthur McEvoy’s famous argument on “The Fisherman’s Problem” and Garrett Hardin’s essay on “The Tragedy of the Commons” (McEvoy, 1986; Hardin, 1968; for a critical analysis of this neo-Malthusian argument, see Locher, 2013; Locher, 2020).

As a result, by 1820, practically no seals were left in South Georgia. For instance, Scottish sealer-explorer James Weddell – known for the exploration of the Weddell Sea, with the Weddell seal still carrying his name – estimated in 1822 that 1.2 million fur seals had been slaughtered in South Georgia alone (Busch, 1985, p.36; Burton in Riffenburgh, 2007, p.875; Laws, 1953, p.746). Sealers thus had to turn to other islands and archipelagos where peaks and collapses followed in the very same pattern over the next four decades. After South Georgia, seals in the South Shetlands (1820s), Crozet and Prince Edward Islands (1840s), and Kerguelen and Heard Islands (1850s and 60s) all experienced a similar fate (for Kerguelen and Heard Islands, see Bertrand, 1971, p.235-254; peaks are taken from Headland, 2009, p.60-62). Although some seal populations showed signs of recovery during the second half of the nineteenth century, allowing thus for new sealing missions in particular in South Georgia and the South Shetlands, catches would never reach the high numbers seen during the late eighteenth and early nineteenth centuries.

Historians identified two types of trades that dominated the Antarctic sealing industry, with two distinct products and markets. Fur sealing provided fur and pelts, and elephant sealing provided high-quality oil. The markets were in the United States, in Canton (China), but also in Britain and Europe. Whereas fur prices were subject to large fluctuations throughout the nineteenth century, seal and whale oil prices remained relatively stable. Indeed, elephant seal oil and whale oil were considered equivalent products, and their respective price variations were almost identical throughout the nineteenth century (Basberg & Headland, 2008, p.17-18). The oil was used for heating, lubrication, lighting, and treating leather even though by the end of the nineteenth century, mineral oil was starting to replace at least for some applications

seal and whale oil. Sealers would sometimes target both markets, as oil gained from the blubber of elephant seals could easily complement the fur seal skin harvest. Conversely, whalers too were sometimes involved in sealing, especially at Heard and Kerguelen Islands, where they could stock up on seals too (Burton in Riffenburgh, 2007, p.876).

Regulations took a long time to be put in place, even though ideas to regulate commercial sealing were expressed from the very beginning of the boom of the sealing industry in Antarctica. For instance, John Leard of the Royal Navy suggested as early as 1789 to limit the harvest numbers and differentiate according to sex and length of the animals (Burton in Riffenburgh, 2007). In the 1820s, James Weddell renewed this call for regulation, also because he had firsthand experience of the cruel practice of letting large numbers of seal pups starve to death because all adult animals were killed without distinction. He was nonetheless convinced that a “sustainable” harvest was possible if one would not, for instance, kill female fur seals until their pups were independent (Burton in Riffenburgh, 2007, p.876; Bonner, 1987, p.20). Jerome Henry Kidder, a naturalist aboard the USS Swatara of the United States Transit of Venus expedition (1874-75), who collected marine animals at Kerguelen and saw the devastation several decades of sealing had caused there, expressed the same hope that sealers “may learn from past experience to carry on their hunting operations with more judgment, sparing breeding females and very young cubs” (Kidder, 1876, p.40).

Polar and environmental historians also have shown that one particularly popular measure at the turn of the centuries to regulate the industry (based on a several centuries old custom) was to put the environment under contract, and to sell concessions to private parties for natural resources exploitation, i.e. to hunt marine mammals. For instance, in 1893 Henry and René Bossière from Le Havre received a 50-year concession to exploit the marine and terrestrial resources of Kerguelen, preceded in only six months by the official annexation of the archipelago by the French government. There were many motivations to deliver these concessions as this represented a convenient way for nation states to affirm their sovereignty claims over a territory that was very difficult to control. Also, it allowed to generate without much effort new sources of income (Monnoir in Le Roux & Morera, in press). Although the control of these extractive activities remained difficult and many enterprises were short-lived financial failures, the concession system allowed for the sealing industry to survive at several places until the 1960s. For instance, first serious attempts to manage the sealing industry in the Antarctic region were made by Great Britain in 1899 when the Falkland Islands Government introduced the so-called *Seal Fishery Ordinance* (with many amendments that followed during the first half of the 20th century). It laid the foundation of what would be called henceforth the “rational” exploitation of seals in South Georgia, an operation that would last until 1964 (Headland, 1984). In Kerguelen too, marine mammals were subject to similar but less successful attempts of “rational” exploitation, first under the concession of the Bossière brothers until the 1930s, and on a more controlled basis under new concessions of the *Société Industrielle des Abatoirs Parisiens* (SIDAP) until the 1960s. The last sealing activity at Kerguelen took place in 1963 (Duhamel & Williams in Duhamel & Welsford, 2011, p.19).

Modern Whaling Activities in the Antarctic and their Regulation

As in the case of sealing, the advent of modern whaling in Antarctica produced a substantial body of historical literature that can only be mentioned here (the standard reference work is the English translation of Arne Odd Johnsen [Johnsen, 1959] and Johan Tønnessen’s [Tønnessen, 1967-1970] four volume work translated as *The History of Modern Whaling* [1982]; see also Jackson, 1978; company histories such as Ian Hart’s abundantly illustrated books add valuable insights to several Antarctic sealing and whaling enterprises). Historians

generally agree that the history of modern whaling in the Antarctic started at the beginning of the twentieth century. The industry was largely dominated by Norwegians which rapidly gained hegemony after the American Civil War in the 1860s. As Johnsen & Tønnessen and many others thereafter have shown, “modern” whaling is closely associated with Norwegian efforts to improve catching techniques, most importantly an invention by sealing and whaling entrepreneur Svend Foyn, who successfully improved existing techniques (Gustafsson in Hacquebord, 2012) to introduce the modern explosive harpoon fired by cannon (Tønnessen, 1967-70; Dorsey, 2013). Coupled with rapid steam catchers, this revolutionary technique was first put to use on the Finnmark coast in northern Norway. With stocks rapidly declining in the Arctic, many expeditions thus left Europe in the 1890s to explore the possibilities of sealing and whaling also in Antarctic waters (Basberg, 2006; Roberts, 2011). Henceforth truly global in scope, the whaling industry became the largest industrial operation outside of Norway until 1924.

Ian Hart, who specializes in company history, has discussed in great detail the complex, multinational nature of early Norwegian shore-based whaling enterprises. For instance, the first land-based whaling station in the Antarctic region was established in 1904 at Grytviken, South Georgia, by Carl Anton Larsen, who received an official whaling lease in 1909 (Hart, 2001). Although the station was Argentinian-owned, it was managed and operated by Norwegians. Other companies joined the effort and in total six stations were set up in South Georgia which rapidly became the main whaling center in the world (Hart, 2006). Other island groups were also targeted early on by whalers, such as the South Shetlands, South Orkneys and Kerguelen Islands. For instance, in 1908 a Norwegian sealing and whaling company managed by Storm, Bull & Co. (later A/S Kerguelen) out of Kristiania (now Oslo) received the right to hunt whales and seals in Port Jeanne d’Arc, Kerguelen Islands, and a whaling and sealing station was set up (Hart, 2020). Labor history has also provided crucial insights here in showing that access to cheap African labor was key to these Norwegian global entrepreneurship initiatives. For instance, although systematically omitted in official historical accounts, around thirty migrant workers recruited in South Africa from Natal and Zululand helped build the station and factory in the South of Kerguelen, and work the whales and seals over a period of five years (Borresen in Kjerland & Bertelsen, 2015, p.135-6). After the war, the South African company *Irvin and Johnson* (renamed in 1924 the *Kerguelen Sealing and Whaling Company*) sub-contracted again under the Bossière concession in 1920 and worked the station once more until February 1927. However, the publicly contested hunting practices of the sub-contractors made the Bossière brothers lose their concession and the French Colonial Ministry finally refused to renew their contract (Delépine, 1995, p.123). French naturalists played a crucial role in this development, such as Abel Gruvel, a French colonial fisheries expert from the Natural History Museum in Paris, and Etienne Peau from the Natural History Museum in Le Havre (he visited Kerguelen islands with his son in 1923), who both publicly denounced the cruel and senseless slaughter of sea elephants (on Gruvel, see for example Tønnesson & Johnson, 1982, p.217). Shore station whaling remained dominant in Antarctica until the 1920s and some shore stations even survived until around 1960.

Many historians have shown that the nature of whaling changed substantially during the mid-1920s, when offshore whaling with factory ships accompanied by catcher boats – also known as pelagic whaling – was introduced (see for example Arnaud, Beurois, Couesnon & Le Mouël, 2007; Tønnessen & Johnson, 1982). One decisive development was the fact that whaling companies could now operate outside of territorial waters and thus also of national legislation. This major change was relatively quickly accompanied by an early sense of the great vulnerability of the Antarctic baleen whale populations to excessive hunting, introducing calls for international regulation (Antonello, 2019). The International Whaling

Commission, set up in 1946, intended to actively regulate the industry, most notably by introducing quotas and regulations, but whaling historians generally agree on the fact that control mechanisms remained very weak and important whaling nations, such as the Soviet Union, underreported catches systematically as they were hunting whales illegally on a very important scale and over a long period of time (Yablokov, 1994; Gambell, 1999; Brownell, Yablokov & Ivashchenko in Thewissen & Kovacs, 2018; Jones, 2022). In particular historian Kurkpatrick Dorsey has analysed in detail, from the standpoint of diplomatic environmental history, the devastating environmental impact the whaling and sealing industries had in the Antarctic region, mostly because of the very slowly moving political measures taken throughout the twentieth century to counter these effects (Dorsey, 2013; Dorsey in Bsumek, Kinkela & Lawrence, 2013). Indeed, throughout the 1950s and 60s, consistently high catches were reported in the Antarctic region, yet by the late 1960s, practically all species, except the smallest baleen whales, were almost pushed to extinction (Tønnessen & Johnsen 1982; Gambell, 1993; Leaper & Miller, 2011).

The historiography of environmentalism has shown that the period of the 1960s and 1970s is crucial also for the Antarctic environment, as one can observe the birth of a new form of sensitivity in favor of the protection of the world seas. For instance, environmental pressure groups started to actively push, from the 1970s onwards, the conservation issue of whales – Greenpeace launched its first important anti-whaling campaign in 1975 – and public opinion (outside of very few determined whaling nations) started to generally agree on the immoral nature of the industry (Hays, 1993; Radkau, 2008; Nash, 1989). Historian Kurkpatrick Dorsey and political scientist Charlotte Epstein identified science as an important driver of this movement. Both argued that whale song recordings, together with assigning human emotions to whales, represented key emotional elements that brought about an overwhelming public pressure (Dorsey, 2013; Epstein, 2009). The intensification of public protest during the late 1970s thus was an important incentive in pushing the International Whaling Commission (IWC) to finally introduce in 1982 a moratorium on commercial whaling, a regulation that came into force in 1986. By then, however, total stocks of southern baleen whales which were the main targets of the industry, were already reduced to well below half of those at the beginning of the 20th century (Headland, 2008). Only Japan, besides Iceland and Norway, continued (with interruptions) with so-called “scientific whaling” in Antarctic waters. With growing pressure and critic coming also from the United Nations debunking the scientific necessity of whaling, Japan finally terminated in 2019 its Antarctic whaling programme, whilst relaunching at the same time commercial whaling activities in its own national waters (Hurst, 2020).

‘Unconventional’ Resource Exploitation in Antarctica

Whereas sealing and whaling have attracted a large number of historical studies in the past, other important themes still are largely understudied, such as the history of the Antarctic fisheries industry, or ice harvesting. Indeed, Robert Headland has identified three exploitative periods in Antarctic history, two of which have already been discussed so far: sealing, whaling and finally fishing. In the 1980s, he considered mineral extraction a possible fourth, and ice harvesting a possible fifth extractive period (Headland, 1989, p.28). For environmental historians, krill fishing in Antarctic waters has proven a particularly promising field. Christian Kehrt and Fabien Locher have already demonstrated its historical importance for understanding key debates during the Cold War such as the conquest of the oceans as a new resource frontier, the diagnosis of overfishing and the global fisheries crisis, and calls for global environmental regulation (Kehrt, 2014; Kehrt, 2020; Locher, 2020). Indeed, Antarctic krill was praised during the 1970s as an abundant, ‘unconventional’ protein source, potentially capable of solving the problem of world hunger. Starting in the early 1960s, the

krill industry first attracted experimental fishing fleets (composed of Stern trawlers) from the Soviet Union and later Japan, with several smaller actors entering the field in the late 1970s (Bonner, 1981). Although the industry collapsed together with the Soviet Union, it produced new important scientific insights into the Antarctic food web, demonstrating at the same time the inherent limits of the then dominant maximum sustainable yield exploitation measures (see Bonner, 1981; Kehrt, 2014). As Antarctic ecosystems rely so heavily on krill, many believe that conservation measures must not only include icon species but also krill populations, especially in times of climate change and melting ice (see Provant et al., 2021). Indeed, according to a recent Greenpeace report, the new gain of interest in krill fishing today will necessitate drastic conservation measures in the near future (Greenpeace, 2018).

Finally, a closely related topic that environmental historians only recently started exploring is iceberg harvesting, thus documenting at the same time the changing perceptions of Antarctic ice. To be sure, ice already attracted in the past important historical studies that are highly relevant to an environmental history of Antarctica, such as Stephen Pyne's masterful description of the white continent that has seen many reeditions since its first publication in 1986 (Pyne, 1986), or Mark Carey's innovative historical work on glaciers (Carey, 2007). More recently, environmental historian Ruth Morgan added an important resource dimension to this body of work. As yet another example of an unconventional (namely fresh-water) resource that gained renewed interest during the 1960s and 1970s (see for example Weeks and Campbell, 1973), Morgan shows that iceberg harvesting must be read within the same historical framework of resource scarcity and population growth as the development of the Antarctic krill fishing industry, and it thus offers another rich case study for environmental historians interested in resource imaginaries of Antarctica, and the rise of neo-Malthusian environmentalism (Morgan, 2018).

A History of Commercial Tourism in Antarctica

As shown in the previous section, Antarctic waters saw a great diversity of economic activities develop over the past centuries, yet this was not the case of the Antarctic continent itself. Indeed, besides the important postal business (for the French case, see Couesnon & Guyader, 1999), and the sale of collected items such as meteorites, there is only one other major commercial activity tied to the Antarctic continent itself, and that is tourism. In the research literature, it is frequently considered both, an important benefactor but also a huge detractor to the integrity of the Antarctic ecosystem. Adrian Howkins rightly pointed out that a useful model to think about this inherent contradiction is the double role the U.S. National Park Service needs to fulfil, i.e. the active encouragement of tourism via recreational activities, and the protection of nature for future generations of tourists to enjoy the parks (Howkins, 2016, p.175-176). This can be of course problematic as the presence of tourists in too important numbers can pose a real threat to the integrity of the park ecosystem. It is easy to see how this translates to the polar regions and the Antarctic continent in particular, where, for instance, the non-intentional introduction of invasive species through tourists has become one of the major ecological threats to the Antarctic ecosystem. As Rosamunde Reich has shown in one of the first historical studies on the subject, commercial tourism in Antarctica was identified as early as 1978 as one of the six major issues which demand urgent action in the near future in terms of stricter regulation (Reich, 1980). More recent studies have shown that this concern has not only remained an important topic over the past decades, but that it also has intensified in concert with a rapidly growing, and ever more diversified polar tourism sector (Beck, 1994; Liggett et al., 2011).

From a historical point of view, one must of course stress that polar tourism is a recent phenomenon. Until the 1960s, rather than being perceived as an exciting tourist destination, Antarctica was mostly thought of as a forbidding and even physically threatening environment, an isolated and barren continent with a treacherous climate (cf. Antonello, 2019, p.22). To be sure, company historians such as Ian Hart have identified several early occasions on which travellers could embark on whaling or postal and servicing boats from the early twentieth century onwards. For instance, Hart considered a converted trawler bringing mail to the whaling stations between the Falkland Islands and the Dependencies, carrying a few paying passengers, the first Antarctic cruise ship (Hart, 2006, p.221; see also Stonehouse & Snyder, 2010, p.46). Yet these activities were mostly episodic in nature, and polar historians thus usually prefer to point to the mid- and late-1950s as the birth period of the Antarctic tourism industry. In 1958, Argentinian and Chilean tourist boats carried the first few hundred fare-paying passengers to the South Shetland Islands, visiting in some cases also the Antarctic Peninsula (Headland, 1994). Modern Antarctic tourism as we know it today, with regularly recurring commercial travel activities started in 1966, under the initiative of Swedish-American entrepreneur Lars-Eric Lindblad and the travel company he founded in Connecticut in 1958, Lindblad Travel Inc. (Lindblad & Fuller, 1983; Stonehouse & Snyder, 2010). Lindblad pioneered the polar travel industry in many ways, most notably by introducing the modern expedition cruise industry to Antarctica, an industry that is still flourishing today. For instance, in 1969 he acquired a purpose-built ship, the Lindblad Explorer, that could take up to 108 passengers to the remotest locations on Earth, spanning from the Arctic to the Antarctic. Since then, expedition cruises to the Antarctic Peninsula, the dominant cruise modality, have been proposed every year, with demand increasing rapidly since the early 1990s (Liggett et al., 2011; Bauer & Dowling in Fennell & Dowling, 2009). Indeed, the collapse of the Soviet Union made available a large number of icebreaker vessels that could be chartered or acquired by tourist operators (Howkins, 2017, p.206; Headland, 2009, p.57).

In her pioneering study, historian Rosamunde Reich also pointed out that boats are not the only means to visit Antarctica and the surrounding region, although marine-based tourism remains until today the most important sector. Tourist flights, even though much less frequent, also occurred on a regular basis from 1956 onwards, some even implicating landings on the continent (Reich, 1980). For instance, a Chilean tourist aircraft overflew the Antarctic Peninsula on 22 December 1956, and a Pan American Airways B-377 Stratocruiser, also carrying tourists, landed the following year at McMurdo Sound. Qantas and Air New Zealand are two of the major airlines that revived this Antarctic tradition in the 1970s, with Qantas offering still nowadays scenic day flights from different cities in Australia (<https://www.antarcticaflights.com.au>). These operations are of course not without risk and one of the scenic flights operated by Air New Zealand in 1979 ended in a deadly catastrophe. Known as the Mount Erebus disaster, all 257 persons aboard died in a direct collision on a lower flank of the volcano. (Swithinbank, 1993; Wace, 1990). As most of the remains were never recovered, the crash site was officially declared a tomb by the XI Antarctic Treaty Consultative Meeting in 1981 (Headland, 2009, p.466).

Better connecting Antarctica and the sub-Antarctic islands to the rest of the world, also for the benefit of tourism, was frequently used in the past as an argument for large-scale, high-modernist infrastructural projects, such as the construction of landing strips for heavy aircraft. In fact, many nations dispose of landing capacities on the white continent, some potentially capable of receiving large commercial planes as demonstrated most recently for the first time by an operator flying from Cape Town and landing in Antarctica (<https://aviationsourcenews.com/general-news/hifly-becomes-the-first-operator-to-land-an-airbus-a340-in-antarctica/>). Science and environmental historians have shown that France

has a particularly checkered past regarding polar landing strips. For instance, one much debated but finally rejected project was the construction of an aerodrome in Kerguelen islands, intended as a large hub that would open up new polar air-traffic routes (see for example *Territoire des Terres Australes et Antarctiques Françaises*, 1961, p.55). Another highly controversial project was realized in Terre Adélie, in the Pointe Géologie archipelago. Planned during the 1970s in order to intensify French presence in the region and extend the temporal and geographic frame of scientific research to facilitate access to the interior of the Antarctic continent where important glaciological work was going on (see Jouvenet, 2022 for a history of French contributions to ice coring in Antarctica), the construction of an Antarctic landing strip was proposed. Throughout the 1980s, the project met massive public protest due to its controversial ecological consequences, involving also several on-site interventions from Greenpeace activists. Despite public outcry, construction work went ahead in 1983, several islands were blasted in order to level the ground and use the earth to fill the gaps between five aligned islands in order to build the airstrip. Built at great economic and environmental costs, severe weather conditions rapidly fragilized major parts of the strip and it was officially declared closed in 1996. The airstrip serves today only for logistical boat operations and fuel storage (cf. Kehrt in Heine & Meiske, 2022). Today, the officially abandoned airstrip is an important reminder that in Antarctic history, science, technology, politics and sovereignty issues remain intimately linked (Martin-Nielsen, 2022).

Even though landing strips revolutionized Antarctic science and logistics, their construction had far less impact on the tourism industry. Indeed, one of the most important changes was initiated by the tourism sector itself during the early 1990s (Splettstoesser, 2000). The Antarctic tourism industry saw a major change with the birth of the International Association of Antarctic Tour Operators (IAATO) which was founded in 1991 by seven tour operators (including Lindblad), anticipating new environmental regulations, most importantly the Protocol on Environmental Protection to the Antarctic Treaty (the Madrid Protocol, concluded in 1991, entered into force in 1998). As a self-regulatory tourism industry association, its declared goal is the promotion of safe and environmentally responsible travel to the Antarctic region (see IAATO homepage, <https://iaato.org/>). Introduced during a period of massive expansion of the tourism sector, IAATO counts today over 100 operator members, including all the major Antarctic cruise organizers, representing thus also powerful force in Antarctic politics. Although the environmental regulations voluntarily adopted by IAATO are often more stringent than those adopted by participants of national research programmes, the tourism sector remains in the eyes of major environmental organizations, such as Greenpeace, a great threat to the Antarctic environment (Howkins, 2017). In fact, as tourism lies outside of the scientific paradigm, the industry may even pose a threat to the political status quo of the Antarctic Treaty System in the near future (Howkins, 2017). In any case, IAATO's self-regulation has led over the past decades to a problematic complacency among Treaty members, who all have failed to develop a comprehensive regulation framework which will be needed in order to continue to accommodate the growing industry (Liggett & Stewart, 2017). Also, if one can turn "last chance" tourism (i.e. tourists that want to see Antarctica before it's too late; see Vila et al., 2016) into 'true' environmental ambassadorship, as intended for instance by IAATO, remains an open question. Indeed, although the term "Antarctic ambassadorship" is increasingly used by the tourism industry to represent an individual's connection to Antarctica and their subsequent environmental advocacy, the concept remains contested, also due to its highly ambiguous nature (Alexander et al., 2019). Moreover, in the scholarly literature on Antarctic tourism, ambassadorship is often assumed and rarely questioned (Alexander et al., 2019). Environmental historians need to be attentive to these developments as the notion raises important questions not only about the changing nature of Antarctic tourism and of its public justification, but also about broader

developments in the changing place of Antarctica in developing awareness for environmental issues.

Conclusion

As this literature review has shown, the environmental history of Antarctica is still in its infancy. However, many recent efforts conducted by a new generation of historians have already allowed to propose some powerful counternarratives, often challenging the frequent and erroneous assumption that conservation and environmental protection were largely absent from Antarctic affairs before the 1970s. In this sense, environmental history started offering a far more complex and nuanced account of the so-called “greening” of the poles, reaching well beyond “declensionist” narratives and conservation success stories that commonly pervade not only environmental histories but also public discourse. Indeed, there is nothing inevitable about the “greening” of the poles, nor is it their natural destiny. Science, politics, imperialism and imaginaries all have played an important role in this story.

These counternarratives are perfectly in line with broader efforts in reconstructing the “environmental reflexivity” of past societies, as proposed, for instance, by environmental historians Fabien Locher and Jean-Baptiste Fressoz (Locher & Fressoz, 2012). They neatly illustrate that discussion about environmental protection, conservation, sustainability or even sovereignty are closely linked to debates about science and technology, and this holds particularly true for Antarctica. The management of living resources, as already seen, is a case in point and other iconic examples that can only be mentioned here comprise the rise of ice core science during the Cold War (see for example Jouvenet, 2022), the discovery of the Antarctic “ozone hole” in 1985 and the Montreal Protocol negotiations (see Grevsmühl, 2017; Grevsmühl, 2018; Grevsmühl & Briday, 2023), and finally the disintegration of Larsen-B Ice Shelf and fears of a possible collapse of the West Antarctic Ice Sheet (on histories of satellite observations of ice see for example Wormbs, 2018; Wormbs in Christiansen et al. 2013; Yusoff, 2005) which are tightly bound to debates on anthropogenic climate change and sea level rise.

Finally, as these debates reach well beyond expert and scientific circles, and also take place within the public sphere, it is important to stress the role of images and imaginaries in the meaning-making of our polar perceptions, perception that have evolved considerably over time. To be sure, this review has revealed that rules, regulations, legal frameworks and questions of sovereignty are of course central to an environmental history of the Antarctic, but it is equally important to think about how associated imaginaries, representations and metaphors evolved over time (for instance, for a history of laboratory metaphors in Antarctica, see Grevsmühl in Herzberg, Kehrt & Torma, 2019). In his essay on iconic images of key 20th-century environmental crises, the late Denis Cosgrove has pointed at the changing geographies of environmental concern, noting an important shift from the temperate to the polar regions (Cosgrove, 2008). He furthermore analysed the evolving roles of physical nature itself in shaping the images meaning and compositions. Integrating the now rapid changes of the natural world and the many ways in which they also shape human activities in our historical accounts of the polar regions – Sverker Sörlin has called this a “cryo-history” of the Anthropocene (Sörlin in Herzberg, Kehrt & Torma, 2019) – is certainly one of the great challenges that still lie ahead of environmental history.

Further Reading

- Antonello, A. (2019). *The greening of Antarctica: Assembling an international environment*. Oxford University Press.
- Dodds, K., Hemmings, A. D., & Roberts, P. (Eds.). (2017). *Handbook on the politics of Antarctica*. Edward Elgar.
- Dorsey, K. (2013). *Whales and nations: Environmental diplomacy on the high seas*. University of Washington Press.
- Headland, R. (2009). *A chronology of Antarctic exploration: A synopsis of events and activities until the International Polar Years, 2007-09*. Bernard Quaritch.
- Howkins, A. (2016). *The polar regions: An environmental history*. Polity Press.
- Howkins, A. (2017). *Frozen empires: An environmental history of the Antarctic peninsula*. Oxford University Press.
- Howkins, A., & Roberts, P. (Eds.). (2023). *The Cambridge history of the polar regions*. Cambridge University Press.
- Joyner, C. (1998). *Governing the frozen commons: The Antarctic regime and environmental protection*. University of South Carolina Press.
- Martin-Nielsen, J. (2023). *A few acres of ice: Environment, sovereignty, and 'Grandeur' in the French Antarctic*. Cornell University Press.
- Pyne, S. (1986). *The ice: A journey to Antarctica*. University of Iowa Press.
- Roberts, P. (2011). *The European Antarctic: Science and strategy in Scandinavia and the British empire*. Palgrave.
- Roberts, P., van der Watt, L.-M., & Howkins, A. (Eds.). (2016). *Antarctica and the Humanities*. Palgrave.
- Sörlin, S. (2019). Cryo-history: Ice, snow and the great acceleration. In J. Herzberg, C. Kehrt, & F. Torma (Eds.), *Ice and snow in the Cold War: Histories of extreme climatic environments* (pp.20-45). Berghahn Books.

References

- Alexander, K. A., et. al. (2019). What and who is an Antarctic ambassador?. *Polar Record*, 55(6), 497-506.
- Antonello, A. (2014). Nature conservation and Antarctic diplomacy, 1959-1964. *The Polar Journal*, 4(2), 335-353.
- Antonello, A. (2019). *The greening of Antarctica: Assembling an international environment*. Oxford University Press.
- Antonello, A., & Howkins, A. (2020). The rise of technocratic environmentalism: The United States, Antarctica, and the globalisation of the environmental impact statement. *Journal of Historical Geography*, 68, 55-64.

Arnaud, P., Beurois, J., Couesnon, P., & Le Mouël, J.-F. (2007). *Phoquiens de la Désolation: La chasse aux éléphants de mer aux îles Kerguelen par les navires-usines français, 1925-1931*. Editions Jambois.

Aronova, E. (2017). Geophysical datascapes of the Cold War: Politics and practices of the World Data Centers in the 1950s and 1960s. *Osiris*, 32(1), 307-327.

Barnes, J. (1982). *Let's save Antarctica!*. Richmond Publications.

Basberg, B. (2006). Perspectives on the economic history of the Antarctic region. *International Journal of Maritime History*, 18(2), 285-304.

Basberg, B., & Headland, R. (2008). *The 19th century Antarctic sealing industry: Sources, data and economic significance*, NHH Department of Economics Discussion Paper no.21. Available online <https://ssrn.com/abstract=1553751>.

Bauer, T., & Dowling, R. (2009). Ecotourism policies and issues in Antarctica. In D. Fennell, & R. Dowling (Eds.), *Ecotourism policy and planning* (pp.309-329). CABI.

Beck, P. (1994). Managing Antarctic tourism: A front-burner issue. *Annals of Tourism Research*, 21(2), 375-386.

Beck, P. (1986). *The international politics of Antarctica*. Croom Helm.

Beck, P. (1984). The United Nations and Antarctica. *Polar Record*, 22(1), 137-144.

Bertrand, K. (1971). *Americans in Antarctica: 1775-1948*. American Geographical Society.

Bonner, N. (1987). Antarctic science and conservation: The historical background. *Environment International*, 13(1), 19-25.

Bonner, N. (1981). The krill problem in Antarctica. *Oryx*, 16(1), 31-37.

Bonner, N., & Laws, R. (1964). Seals and sealing. In R. Priestley, R. J. Adie, & G. du Q. Robin (Eds.), *Antarctic research: A review of British scientific achievement in Antarctica* (pp.176-177). Butterworths.

Borresen, D. I. (2015). 'Three black labourers did the job of two whites': African labourers in modern Norwegian whaling. In K. A. Kjerland, & B. E. Bertelsen (Eds.), *Navigating colonial orders: Norwegian entrepreneurship in Africa and Oceania* (pp.127-151). Berghahn Books.

Brownell, R., Yablokov, A., & Ivashchenko, Y. (2018). Whaling, illegal and pirate. In B. Würsig, J. G. M. Thewissen, & K. Kovacs (Eds.), *Encyclopedia of marine mammals*, 3rd ed., (pp.1063-1066). Academic Press.

Burnett, G. (2012). *The Sounding of the whale: Science & cetaceans in the twentieth century*. University of Chicago Press.

Busch, B. C. (1985). *The war against the seals: A history of the North American seal fishery*. McGill-Queen's University Press.

Cary, M. (2007). The history of ice: How glaciers became an endangered species. *Environmental History*, 12(3), 497-527.

Chaturvedi, S. (1996). *The polar regions: A political geography*. John Wiley.

Chaturvedi, S. (2013). Rise and decline of Antarctica in Nehru's geopolitical vision: Challenges and opportunities of the 1950s. *Polar Journal*, 3(2), 301-315.

Cosgrove, D. (2008). Images and imagination in the 20th-century environmentalism: From the Sierras to the poles. *Environment and Planning A*, 40(8), 1862-1880.

Couesnon, P., & Guyader, A. (1999). *Histoire postale des Terres australes et antarctiques françaises: Des origines à 1955*. Sofag.

Crawford, E., Shinn, T., & Sörlin, S. (1993). *Denationalizing Science*. Kluwer Academic.

Cook, J. (1777). *A voyages towards the South Pole, and round the world*. Stahan & Cadell.

Dahl, J., Roberts, P., & van der Watt, L.-M. (2019). Is there anything natural about the polar?. *Polar Record*, 55(5), 326-329.

Dean, K., Naylor, S., Turchetti, S., & Siegert, M. (2008). Data in Antarctic science and politics. *Social Studies of Science*, 38(4), 571-604.

Delépine, G. (1995). *Les îles australes françaises: Kerguelen, Crozet, Amsterdam, Saint-Paul*. Editions Ouest-France.

Dodd, K. (1997). *Geopolitics in Antarctica: Views from the Southern oceanic rim*. John Wiley.

Dodds, K. (2002). *Pink Ice: Britain and the South Atlantic empire*. I.B. Tauris.

Dodds, K., Hemmings, A. D., & Roberts, P. (Eds.). (2017). *Handbook on the politics of Antarctica*. Edward Elgar.

Dorsey, K. (2013). *Whales and nations: Environmental diplomacy on the high seas*. University of Washington Press.

Dorsey, K. (2013). National sovereignty, the International Whaling Commission, and the Save the Whales movement. In E. M. Bsumek, D. Kinkela, & M. A. Lawrence (Eds.), *Nation-states and the global environment: New approaches to international environmental history* (pp.43-61). Oxford University Press.

Duhamel, G., & Williams, R. (2011). History of whaling, sealing, fishery and aquaculture trials in the area of the Kerguelen Plateau. In G. Duhamel, & D. C. Welsford (Eds.), *The Kerguelen Plateau: Marine ecosystem and fisheries* (pp.15-28). Société Française d'Ichtyologie.

Du Pasquier, T. (1982). *Les baleiniers français au XIXe siècle: 1814 – 1868*. Editions des 4 Seigneurs.

Epstein, C. (2009). *The power of words in international relations: Birth of an anti-whaling discourse*. MIT Press.

Fogg, G. (1992). *A history of Antarctic science*. Cambridge University Press.

Gambell, R. (1993). International management of whales and whaling: An historical review of the regulation of commercial and aboriginal subsistence whaling. *Arctic*, 46(2), 97-107.

Gambell, R. (1999). The International Whaling Commission and the contemporary whaling debate. In J. Twiss, & R. Reeves (Eds.), *Conservation and Management of Marine Mammals* (pp.179-198). Smithsonian Institution Press.

Grady, D. (1986). *Sealers and whalers in New Zealand waters*. Reed Methuen Publishers.

Greenpeace (2018). *Licence to krill: The little known world of Antarctic fishing*, March 2018. Available online <https://www.greenpeace.org/international/antarctic-krill-report>.

Grevsmühl, S. (2017). A visual history of the ozone hole: A journey to the heart of science, technology and the global environment. *History and Technology*, 33(3), 333-344.

Grevsmühl, S. (2019). Laboratory metaphors in Antarctic history: From nature to space. In J. Herzberg, C. Kehrt, & F. Torma (Eds.), *Ice and snow in the Cold War: Histories of extreme climatic environments* (pp.211-235). Berghahn Books.

Grevsmühl, S. (2018). Revisiting the ozone hole metaphor: From observational window to global environmental threat. *Environmental Communication*, 12(1), 71-83.

Grevsmühl, S., & Briday, R. (2023). Satellite images as tools of visual diplomacy: NASA's ozone hole visualizations and the Montreal Protocol negotiations. *The British Journal for the History of Science*, First View, 1-12.

Gustafsson, U. (2012). A science and technology studies (STS) approach on the evolution of the modern whaling industry. In L. Hacquebord (Ed.), *LASHIPA: History of large-scale resource exploitation in polar areas* (pp.113-126). Barkhuis.

Handmer, J. (Ed.). (1989). *Antarctica: Policies and policy development*. Australian National University.

Hardin, G. (1968). The Tragedy of the Commons. *Science*, 162(3849), 1243-1248.

Hart, I. (2001). *Pesca: A history of the pioneer modern whaling company in the Antarctic*. Aidan Ellis Publishing.

Hart, I. (2006). *Whaling in the Falkland Islands Dependencies, 1904-1931: A History of the shore and bay-based whaling in the Antarctic*. Pequena.

Hart, I. (2020). *Austral Enterprises*. Pequena.

Hays, S. (1993). *Beauty, health and permanence: Environmental politics in the United States, 1955-1985*. Cambridge University Press.

Headland, R. (1989). *Chronological list of Antarctic expeditions and related historical events*. Cambridge University Press.

Headland, R. (2009). *A chronology of Antarctic exploration: A synopsis of events and activities until the International Polar Years, 2007-09*. Bernard Quaritch.

Headland, R. (1994). Historical development of Antarctic tourism. *Annals of Tourism Research*, 21(2), 269-280.

Headland, R. (1984). *The island of South Georgia*. Cambridge University Press.

Howkins, A. (2008). Defending polar empire: Opposition to India's proposal to raise the 'Antarctic Question' at the United Nations in 1956. *Polar Record*, 44(1), 35-44.

Howkins, A. (2011). Melting empires? Climate change and politics in Antarctica since the International Geophysical Year. *Osiris*, 26(1), 180-197.

Howkins, A. (2016). *The polar regions: An environmental history*. Polity Press.

Howkins, A. (2017). *Frozen empires: An environmental history of the Antarctic peninsula*. Oxford University Press.

- Howkins, A., & Roberts, P. (Eds.). (2023). *The Cambridge history of the polar regions*. Cambridge University Press.
- Hurst, D. (2020). Japanese whaling is down but not out. *The Interpreter*, 03/04/2020. Available online <https://www.lowyinstitute.org/the-interpreter/japanese-whaling-down-not-out>.
- Jackson, A. (2021). *Who saved Antarctica? The heroic era of Antarctic diplomacy*. Palgrave Macmillan.
- Jackson, G. (1978). *The British Whaling Trade*. A. & C. Black.
- Jallatt, D. (2009). Le tourisme polaire et sa construction dans l'histoire. *Téoros*, 28(1), 21-28.
- Johnsen, A. O. (1959). *Den moderne hvalfangsts historie: Opprinnelse og utvikling*. Vol. 1. H. Aschehoug & Co.
- Jones, A. G. E. (1981). The British southern whale and seal fisheries. *The Great Circle*, 3(1), 20-29.
- Jones, R. T. (2022). *Red leviathan: The secret history of Soviet whaling*. University of Chicago Press.
- Jouvenet, M. (2022). *Des glaces polaires au climat de la Terre: Enquête sur une aventure scientifique*. CNRS Editions.
- Joyner, C. (1987). The Antarctic minerals negotiating process. *The American Journal of International Law*, 81(4), 888-905.
- Joyner, C. (1998). *Governing the frozen commons: The Antarctic regime and environmental protection*. University of South Carolina Press.
- Kehrt, C. (2014). Dem Krill auf der Spur: Antarktisches Wissensregime und globale Ressourcenkonflikte in den 1970er Jahren. *Geschichte und Gesellschaft*, 40(3), 403-436.
- Kehrt, C. (2020). Krill: The invention of a global resource in the long 1970s. *Global Environment*, 13(3), 634-658.
- Kehrt, C. (2022). Landing strips and penguins: Ecological oppositions to the scientific exploration of Antarctica. In E.-C. Heine, & M. Meiske (Eds.), *Beyond the lab and the field: Infrastructures as places of knowledge production since the late nineteenth century* (pp.196-214). University of Pittsburgh Press.
- Kidder, J. H. (1876). The natural history of Kerguelen Island. *The American Naturalist*, 10(8), 481-484.
- Laws, R. (1953). The elephant seal industry at South Georgia. *Polar Record*, 6(46), 746-754.
- Le Roux, T., & Morera, R. (Eds.). (2024). *La nature sous contrat*. Presses Universitaires de Rennes.
- Leeper, R., & Miller, C. (2011). Management of Antarctic baleen whales amid past exploitation, current threats and complex marine ecosystems. *Antarctic Science*, 23(6), 503-529.
- Lindblad, L.-E., & Fuller, J. G. (1983). *Passport to anywhere: The story of Lars-Eric Lindblad*. Times Books.

- Liggett, D., McIntosh, A., Thompson, A., Gilbert, N., & Storey, B. (2011). From frozen continent to tourism hotspot? Five decades of Antarctic tourism development and management, and a glimpse into the future. *Tourism Management*, 32(2), 357-366.
- Liggett, D., & Stewart, E. (2017). Sailing in icy waters: Antarctic cruise tourism development, regulation and management. In R. Dowling, & C. Weeden (Eds.), *Cruise ship tourism* (pp.484-506). CABI.
- Locher, F. (2013). Cold War pastures: Garrett Hardin and the tragedy of the commons. *Revue d'histoire moderne et contemporaine*, 60(1), 7-36.
- Locher, F. (2020). Neo-malthusian environmentalism, world fisheries crisis, and the global commons, 1950s-1970s. *The Historical Journal*, 63(1), 187-207.
- Locher, F., & Fressoz, J.-B. (2012). Modernity's frail climate: A climate history of environmental reflexivity. *Critical Inquiry*, 38(3), 579-598.
- Martin-Nielsen, J. (2023). *A few acres of ice: Environment, sovereignty, and 'Grandeur' in the French Antarctic*. Cornell University Press.
- Martin-Nielsen, J. (2022). Environment and sovereignty in the Antarctic: The Terre Adélie airstrip. *Journal for the History of Environment and Society*, 7, 97-128.
- Martin-Nielsen, J. (2021). Undecided dreams: France in the Antarctic, 1840-2021. *Polar Record*, 57(e32), 1-14.
- May, J. (1988). *The Greenpeace book of Antarctica: A new view of the seventh continent*. Dorling Kindersley.
- McCann, J. (2018). *Wild sea: A history of the Southern Ocean*. University of Chicago Press.
- McEvoy, A. (1986). *The fisherman's problem: Ecology and law in the California's fisheries, 1850-1980*. Cambridge University Press.
- McGonigal, D. & Woodworth, L. (Eds.). (2003). *Antarctica: The complete story*. Frances Lincoln.
- Morgan, R. (2018). Dry continent dreaming: Australian visions of using Antarctic icebergs for water supplies. *International Review of Environmental History*, 4(1), 145-166.
- Nash, R. (1989). *The rights of nature: A history of environmental ethics*. University of Wisconsin Press.
- Provant Z., et al. (2021). Reframing Antarctica's ice loss: Impacts of cryospheric change on local human activity. *Polar Record*, 57(e13), 1-11.
- Pyne, S. (1986). *The ice: A journey to Antarctica*. University of Iowa Press.
- Radkau, J. (2008). *Nature and power: A global history of the environment*. Cambridge University Press.
- Reich, R. (1980). The development of Antarctic tourism. *Polar Record*, 20(126), 203-214.
- Richards, R. (2010). *Sealing in the southern oceans: 1788-1833*. Paremata Press.
- Riffenburgh, B. (Ed.). (2007). *Encyclopedia of the Antarctic*. Routledge.
- Roberts, P. (2011). *The European Antarctic: Science and strategy in Scandinavia and the British empire*. Palgrave.

- Roberts, P., van der Watt, L.-M., & Howkins, A. (Eds.). (2016). *Antarctica and the Humanities*. Palgrave.
- Russ, R. (2007). History, exploration, settlement and past use of the sub-Antarctic. *Papers and Proceedings of the Royal Society of Tasmania*, 141(1), 169-172.
- Simmons, I. (1993). *Environmental history: A concise introduction*. Blackwell.
- Sörlin, S. (2019). Cryo-history: Ice, snow and the great acceleration. In J. Herzberg, C. Kehrt, & F. Torma (Eds.), *Ice and snow in the Cold War: Histories of extreme climatic environments* (pp.20-45). Berghahn Books.
- Splettstoesser, J; (2000). IAATO's stewardship of the Antarctic environment: A history of tour operator's concern for a vulnerable part of the world. *International Journal of Tourism Research*, 2(1), 47-55.
- Stonehouse, B., & Snyder, J. (2010). *Polar tourism: An environmental perspective*. Channel View Publications.
- Swithinbank, C. (1993). Airborne tourism in the Antarctic. *Polar Record*, 29(169), 103-110.
- Tammiksaar, E., & Lüdecke, C. (2023). The Discovery of Antarctica from Ptolemy to Shackleton. In A. Howkins, & P. Roberts (Eds.), *The Cambridge history of the polar regions* (pp.181-206). Cambridge University Press.
- Territoire des Terres Australes et Antarctiques Françaises. (1961). *TAAF, 14*, La Documentation Française.
- Tin, T. (2013). Environmental advocacy in the Antarctic treaty system: A personal view from the 2000s. *The Polar Journal*, 3(2), 415-430.
- Tønnessen, J. (1967-1970). *Den moderne hvalfangsts historie: opprinnelse og utvikling*, vols. 2-4. Norges Hvalfangstforbund.
- Tønnessen, J., & Johnsen, A. O. (1982). *The history of modern whaling*, translated by R. I. Christophersen. C. Hurst.
- Turchetti, S., Naylor, S., Dean, K., & Siegert, M. (2008). On thick ice: Scientific internationalism and Antarctic affairs, 1957-1980. *History and Technology*, 24(4), 351-376.
- Vila, M., et al. (2016). Contrasting views on Antarctic tourism: 'Last chance tourism' or 'ambassadorship' in the last of the wild. *Journal of Cleaner Production*, 111, 451-460.
- Wace, N. (1990). Antarctica: A new tourist destination. *Applied Geography*, 10, 327-341.
- Watts, S. A. (1992). *International law and the Antarctic treaty system*. Grotius.
- Weeks, W. F., & Campbell, W. J. (1973). Icebergs as a fresh-water source: An appraisal. *Journal of Glaciology*, 12(65), 207-233.
- Wormbs, N. (2013). Eyes on the ice: Satellite remote sensing and the narratives of visualized data. In M. Christiansen, A. Nilsson, & N. Wormbs (Eds.), *Media and the politics of Arctic climate change: When the ice breaks* (pp.52-69). Palgrave.
- Wormbs, N. (2018). Sublime satellite imagery as environing technology. *Azimuth*, 6(12), 77-91.
- Yablokov, A. (1994). Validity of whaling data. *Nature*, 367(108), 108.

Yusoff, K. (2005). Visualizing Antarctica as a place in time. *Space and Culture*, 8(4), 381-398.

Zarankin, A., & Senatore, M. X. (2005). Archaeology in Antarctica: Nineteenth-century capitalism expansion strategies. *International Journal of Historical Archaeology*, 9(1), 43-56.